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WAR IN THE INFORMATION AGE

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Just as the industrial age changed military forces, so will the information age. Industrial nations furnished their military forces with tools very different from those that agrarian nations provided. Information-based nations will organize and equip their armies differently than their industrial counterparts. Whether technological change causes organizational and conceptual change, or vice versa, is not the issue. This is the issue: The dawning of the information age will fundamentally change the conduct of warfare — just as the industrial age did a century and a half ago.¹ It is happening now.

To develop these ideas, this essay describes the industrial period and its effects on the conduct of war. Then it goes on to discuss the characteristics of the information age and their impact on the conduct of warfare and the U.S. Army. We do not know, and cannot know, what this means completely, but we must understand the forest to know which trees to cut and which to nurture. This article is an attempt to describe the forest.

The Industrial Age

Prior to industrialism, Dr. James Schneider explains, the “strategy of a single point was the dominant military paradigm,” and Napoleon’s decisive battle was the classic model.² But the period 1860-1939, during which industrialism was driving toward maturity, brought a new paradigm.

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The military objectives required to ensure victory during the industrial age expanded. They included not only the enemy army — the main objective point for Napoleon and other armies prior to industrialization — but also the enemy's war-making capabilities and resources: infrastructure, manufacturing base and raw materials. An army could not achieve these expanded objectives in one decisive battle. Over time, distributive campaigns replaced the Napoleonic strategy of a single point and decisive battle. A campaign — a sequence of battles, engagements and major operations conducted over time, throughout a specified geographic area, and linked together into a synchronized whole — replaced the notion of a single decisive battle. Finally, to conduct these kinds of campaigns, whether offensive or defensive, required large, dispersed armies that could be coordinated to common effect.

The commanders of these kinds of armies needed a different set of skills than their predecessors. By Napoleon's time, armies were no longer unitary. They were subdivided into divisions and corps. As forces grew in size, armies and army groups emerged. The military became a profession; specialization took effect, and the staff system evolved.³ A military education system emerged in industrial nations to ensure that officers had the conceptual, technical and organizational skills necessary to synchronize the efforts of the disparate parts of their military machines.⁴ The concept of time itself changed.

Mixed in with the development of a new set of conceptual, technical and organizational skills came an explosion of technical innovations. The rifled musket, smokeless powder, the rifle and the machine gun; breech loading and belt loading; processed food; steam-, then gasoline-powered engines; indirect artillery fire; the railroad and the telegraph; mechanization and motorization; and a host of other inventions — all affected the conduct of warfare. Other innovations such as administrative and accounting procedures, preprinted forms, maps, the technical means to coordinate large numbers, accurate portable clocks, the telescope and other nonmilitary inventions also took effect. Front and rear were unified first by rail and ship, then by air. This unification allowed for the continuous flow of personnel, units and supplies. Thus, large, geographically separate formations — controlled by a professional and ever-growing staff — could act as one unified force and grind on toward victory in spite of casualties in personnel or materiel.⁵ The ultimate result: war, conducted and sustained over years in the multiple theaters of two world wars, then in a half-century of global cold war.

Technical advances affected the conceptual and organizational, and vice versa. An advance or a change in one impacted the others. What is clear, however, is this: The industrial age had a dominant method of conducting war, and this method differed from that of the agrarian age.

Thus, industrial armies were fundamentally different from their agrarian predecessors.⁶ The whole approach to war changed. For industrial armies, objectives were distributive: enemy forces, infrastructure, manufacturing base and resources. Industrial armies had to be raised, equipped, trained, educated and organized to conduct sequential, distributive operations throughout the depth of a theater, or multiple theaters, and to sustain such activities over time. Industrial armies needed continuous logistics and mobilization, from rear to front and back; centralized communication; large, bureaucratically organized staffs; and large, durable formations.

Both world wars epitomized industrialism. In World War II, the United States became a war machine capable of continuous, long-run production and mass output of arms, men, units and equipment. Forrest Pogue describes the plan for victory as one in which the United States would “create air superiority, strengthen naval forces, create industrial production sufficient to arm the defenders of the Western Hemisphere, outfit task forces for operations in the Atlantic and in the European Theaters, and furnish weapons and supplies for friendly powers wherever they might be.”⁷ Three characteristics of the World War II model are: (1) an industrial base and a training base; (2) long runs of massed-produced equipment, people and units to be mass distributed from the base to the front, and returned from front to base if need be; and (3) sequential campaigns and operations — the ever-forward-moving front line moving east from the English Channel, west from Russia, or north toward Japan. This was also the model that continued beyond the world wars. It was the model with which America and its allies won the Cold War. It is how the Army has been raised, equipped, deployed, organized, trained, educated, sustained, resourced and commanded and controlled for well over 50 years.

It is a model that mirrored the central governing concepts of the industrial age:

1. The machine as model. Machines are mechanical systems. They consist of standardized, interchangeable parts, each with a single, special function. The parts fit together into a synchronized whole. When the machine is turned on, it works automatically, grinding out its products — each like the other. Using this model, work was simplified to the point where almost anyone could be trained to perform repetitive tasks effectively. Taylorism dominated management theory: the idea that there was one best way and workers were permitted to do only one task. Work became rote; management, rigid; outcomes, predictable.⁸

Military machines and wheels of business are machine-metaphors applied to life in the industrial age. And what controlled these machine-like organizations? A grinding bureaucracy whose defining characteristic was routine and was composed of standardized, interchangeable parts (people), each with a specific function (specialty) that, when put together (departments), would automatically grind out its product (integration and control) using a scientific approach (systems analysis).⁹

2. Paced, sequential, continuous, long-run production. Machines run at a preset, regular, conveyor-belt pace. If one increases or decreases the pace beyond the machine’s set parameters, one risks breaking the machine or producing imperfect goods. Machines of the industrial age, and the organizations modeled after them, worked in sequence. Henry Ford’s famous assembly line became the model not only for manufacturing but also for government, business and other organizations. Business processes were sequential. Concept development, design, production, marketing, sales — each followed the other, but only after a centralized decision approved movement from one department to another. Bureaucracies perfected the assembly-line approach. Industrial-age machines and organizations were efficient because they ran continuously, producing the same product. Retooling a manufacturing line to produce a different product was a major operation that often included closing down part of a plant for weeks or months.

3. Mass output. Perhaps the most recognizable characteristic of the industrial age was mass: mass production, mass media, mass markets, mass advertising, mass consumption, mass education, mass distribution, mass movements and mass religions.¹⁰ A lot of like things: This is what machines — whether corporate, political, economic, social-welfare or military — produce best and cheapest. This is what they are good at. This is what industrialism is all about.

These governing concepts provided the context within which we lived our social, political, economic and private lives. Within industrialized nations, new political architectures emerged, sometimes from debate, other times from conflict, occasionally from civil war. The story of one age replacing another is a story of tension, chaos and an associated, nontrivial potential for violence. Change is unsettling, especially when so much changes, when fundamental values and structures are challenged, and when the future is so uncertain.¹¹

But the dominance of the industrial model is over; the industrial age is passing. The information age has been colliding with the institutions of the industrial age for two decades. The result will not be the complete elimination of industrial structures and institutions, but the information age is coming to dominate the industrial. The transformation from an industrial to an informational society will be as profound as the shift from an agricultural society to an industrial one.¹²

The Information Age

The information age — as the industrial age did before it — will affect social, political and corporate structures as well as public institutions and organizations. And it will alter our private lives.

The entire economy of some nations already is beginning to take on a new structure: more diverse, easily-tailored, decentralized, faster-paced and complex. A new set of principles and new governing concepts are beginning to take shape.¹³ The details remain partially obscured, but the outline is clear. The governing concepts of the information age are taking the following shape:

1. The network as model. Industrialism employed a Newtonian perspective: “In the machine model, ... things can be taken apart ... then put back together without significant loss.”¹⁴ Replacing this perspective, however, is a more holistic one in which relationships among the parts gain importance. In a network, processes — the web of relationships that enhance the flow of information among the parts of an organization, factory or corporation — determine the organization’s ability to be effective and competitive in the information age. Responsibility will remain hierarchical, but the efficacy of hierarchical organizations will diminish as information-sharing networks become the norm.¹⁵ This requires that organizations develop “a sophisticated information network that gathers precise and exhaustive data on markets and customers’ needs, combining it with the newest design methods and computer-integrated production process, and then operating this system with an integrated network that includes not only highly skilled employees of the company but also suppliers, distributors, retailers, and even customers.”¹⁶ Successful networks require high-quality, sophisticated workers and managers.

Workers in an information-age company are not “standardized, interchangeable parts” with little to contribute other than their single, specialized functions along an assembly line or in a bureaucracy. Rather, workers are becoming — and in successful organizations, they already have become — contributors, collaborators, communicators and members of teams. Training and education of workers — as well as worker longevity, loyalty and trust — are absolutely paramount in the information age. Quality is key as never before.

In a corporation organized as a network, middle management positions disappear because two of their main functions — information transfer and worker supervision — dissipate. Computers talking to one another by digital transfer of information and empowered workers becoming more self-regulated are making much of middle management obsolete. Staffs, as they have developed during the industrial age, are changing dramatically. Bureaucracies will not vanish, but they will be organized around information, not functions. Spans of control will grow larger; organizations will be flatter; and process action teams will be more prevalent.¹⁷ Leaders will guide by vision and policy, not by procedure-based rules.

Decisionmaking under these kinds of conditions will also change. Most decisions will be decentralized. Of those that remain centralized, many will be made in a participative way; fewer, by a single leader or manager. Successful corporations will become adaptive organizations, constantly learning and self-renewing in response to external realities, internal changes and market conditions.¹⁸ However decisions are made, successful organizations will have to speed through the decision cycle faster than their competitors. Speed — which is emerging as perhaps the dominant mark of the information age — is one of the most important advantages of the network over the machine.

2. Near-simultaneous, continuous, short-run production. The preset, regular, conveyor-belt pace of the machine age is over. Only fast-paced, adaptive organizations will succeed in this new era of competition. Today, competition comes not only from traditional adversaries in traditional sectors, but also from disintegrating barriers to previously insulated and protected markets. Few corporations can now predict from where their next peer competitor will come. Competition now arises unexpectedly from anywhere.¹⁹

To deal with this degree of uncertainty, information-age corporations seek “to compress product development time, to shrink the interval between the identification of the need for a new product and the beginning of its manufacture.”²⁰ Again, the time between observed need, through decision, to action will get shorter and shorter. Speed in identifying, then meeting new market needs, grows in importance. The inflexible machines and bureaucratic processes of the industrial era justified their expense through mass, but the speed of an information-age corporation will turn this industrial world inside out.

Information-age corporations beat their competition by compressing time; expanding market share, productivity and profitability; eliminating the assembly-line mentality; and reengineering overly bureaucratized organizations. These are keys to success in the information age. “The most basic and common feature” of a reengineered business is the adoption of the network instead of the assembly line as the organizational model. In a network organization, “many formerly distinct jobs or tasks are integrated and compressed into one.”²¹

3. Mass-customized products, precisely targeted, near-instantaneous distribution. Advertising and marketing were the tools to convince the customer to accept mass products. Low prices and sheer abundance helped make this acceptance complete. But demassification is becoming more common, with the niche market replacing the mass market.²² Corporations are able to customize a specific product or service in response to particular customer requirements. Cost-effective, near-instantaneous, mass-customized products and services are now available. Custom design, instant delivery, a product or service adapted to the customer, not vice versa — these are the hallmarks of the information-age business.²³

Information-age production machines can reset themselves, thus allowing continuous-flow, fully-customized production. Mass production will continue to have a place in industry, albeit a smaller one. In the information age, profitability will result not from mass but from precision: first, precision in identifying the needs of a particular market segment; second, in developing and producing a product or service customized to that specific segment; and third, in delivering that product or service — all faster than one's competitor.²⁴ Constant innovation and speed will become two of the important ways to retain one's competitive advantage.

As the information age develops, corporations will not simply spend money on new technology and then use it in old ways. They will not simply ask how they can do things faster and better. These are actions that will already have been taken in the early stages of the information age.²⁵ Rather, corporations will ask, "Why do some things at all?" Success will come to organizations that can exploit the full potential of computer technology within new organizations, new attitudes toward workers and work processes, new ways of operating, and new management concepts — as these new technologies, organizations and concepts are developed. That is, success will come to those who unlearn the rules of the industrial age and adopt the new practices of the information age the fastest.

Information-age principles and governing concepts will provide the framework within which we will live our social, political, economic and private lives. In *The Power Game*, for example, Hedrick Smith describes how the information age has already changed our political processes.²⁶ In *Reinventing Government*, David Osborne and Ted Gaebler suggest ways in which government can deal with this new political landscape.²⁷ In *Changing Fortunes*, Paul Volcker and Toyoo Gyohten describe similar changes, required for similar reasons, in the world monetary system.²⁸ And in "The Tales They Tell In Cyber-space Are A Whole Other Story," Jon Katz describes how information-age technology is changing and will continue to change the publishing world and the movie industry.²⁹ Changing also are our understanding of national sovereignty, the international order, threats to national security, the nature of economic competition, the requirements to succeed in that competitive environment, and America's role in the global community, as well as many other long-held beliefs. We live in a time of transition between the industrial and information ages. It is a time of confusion, uncertainty and change — at times, chaos. Success will come to those organizations that lead their sectors under these near-chaotic conditions.

Ultimately, the information age will come to dominate the industrial. But, as before, this dominance will not be absolute. Vestiges of the industrial and the agrarian ages will remain. While some parts of the world become information-based, others will remain industrial, still others, agrarian. Most others will be in between. Even within nations, all three "ages" may coexist. Many changes will run together. Ours will be a world characterized by variety, increased complexity, and uncertainty.³⁰ Our requirement: to adapt.

Information Age Army

With respect to change, some like to compare today's U.S. Army to its Cold War self. In the spring of 1990 the Army had nearly 6,100 soldiers operationally deployed in 45 countries.³¹ Now there are 21,500 operating in over 70 countries — about a 300-percent increase in operational tempo. During this same period, the Army reduced in size — active, Guard, Reserve and civilian — from 2.0 million to 1.5 million, a 25-percent reduction; reduced force structure from five corps to four, 18 active divisions to 12, and 10 national guard divisions to eight; returned nearly 150,000 soldiers to the United States from bases overseas; and cut the budget by about 40 percent. About half of all Defense Department base closings and personnel reductions accomplished so far have come from the Cold War Army. But the real story is not in how the Army compares to the past, but in how it is transforming for the future.

This transformation is growth. Certainly not growth in the sense of getting larger, but in the sense of progressive development.

Such transformation is not new to the Army. The Army has reinvented itself before.³² The Army has tended to follow society's lead. Today, however, the Army is helping to lead America into the information age. We understand the enormity of the task before us now. Thus we understand the imperative to let intellectual change lead physical change. Over the past several years we have fostered an intellectual debate within the Army to help come to grips with the transformation we have undergone and are undergoing. We are positioning the Army for the information age.³³

The future will find that the concept of war is expanding in at least two ways. First, we will no longer be able to understand war simply as the armies of one nation-state or group of nation-states fighting one another. Somalia demonstrates that this understanding is too narrow — it always has been. Nation-states do not have a monopoly on war-making; a variety of entities can wage war, and have in other periods of history — corporations, religious groups, terrorist organizations, tribes, guerrilla bands, drug cartels or other crime syndicates, clan leaders and others. Further, agrarian-age enemies can buy and employ information-age weaponry. Information-age technology will bring variety to the military sphere as it is bringing it to the economic. The net result is a blurring of the distinction between war and operations other than war.³⁴ Military competitors will arise unexpectedly, and the conditions for decisive victory will differ with each use of military force. Unlike during the Cold War, we do not have the luxury of focusing primarily upon one set of threat, geographic and alliance conditions.

The second way in which the concept of war is expanding concerns conventional combat. The information age will change the scope of war as compared to the industrial age just as the industrial did relative to the agrarian. Agrarian states cannot regenerate their war-making capability; therefore, an armed force has only to defeat an agrarian state's army, or navy in some cases, to achieve victory. Victory against an industrial state, however, requires that an armed force be prepared to destroy not only sufficient portions of the enemy armed forces, but also infrastructure, resources and manufacturing base — that is, war-making capability. Victory over an information-based state goes one step farther. It will entail not only sufficient destruction of the armed forces and physical war-making capability, but also dominance of its information system.

Variety and ambiguity are the norms in the information age — variety and ambiguity in the kind of enemy, the kind of war, the requirements of victory, and the conditions under which the Army will be used. Joint forces; coalitions, sometimes ad hoc; interagency operations; precise rules of engagement, executed under the eye of near-instantaneous, global media; perhaps unreasonable expectations concerning casualties; decreased time between observed crisis and troops on the ground, as well as between arrival in-country and mission completion — all will make each use of military force unique. Information-age tools — speed, customization and precision — have already arrived on the battlefield. Only high-quality soldiers, leaders, staffs and organizations using customization, precision and information to their advantage will succeed in this kind of environment. The military requirements of the information age are upon us today.

The kind of army that can use information age tools and succeed under these conditions differs from the mass-production army of the industrial age. Successful information-age businesses and corporations have had to unlearn industrial practices and apply new principles and concepts to their organizations, processes and operations. We, too, have come to this realization. Certainly, the application in the military will not be exactly the same as that in the corporate world, for the two cultures are fundamentally distinct and recognizing this essential distinction is important. We must also acknowledge, however, that the governing concepts of the information age will change army organizations, processes and operations — as well as the conduct of war.

Distributive campaigns that developed during the industrial age will fade. Emerging in their stead will be simultaneous operations resulting in the near-instantaneous paralysis and destruction of enemy forces, war-making capability and information networks throughout the depth of a theater.

Information-age armies will develop a shared situational awareness. This awareness results from having common, up-to-date, near-complete friendly and enemy information distributed among all elements of a task force. Operational and tactical forces will know where their enemies are and are not — whether those enemies are agrarian enemies such as Somali warlords or Haitian strongmen, industrial enemies such those in North Korea, or yet-to-emerge information-age peers. Of course, this knowledge will never be absolute, and it is folly to assume it ever will become perfect. It will be, however, of an order of magnitude better than that achieved even during the Gulf War. Information-age armies will also know where their own forces are, much more accurately than before — and deny this critical information to the enemy. Enemy and friendly information will be distributed among all the forces — land, sea, air and space — to create a common perception of the battlefield among the commanders and staffs of information-age armies. This shared situational awareness, coupled with the ability to conduct continuous operations day and night, is what will allow information-age armies to observe, decide and act faster and more precisely than their enemies.

Speed and precision are becoming the dominant requirements of the battlefield. Speed and precision result from maneuver platforms, fire support and sustainment systems, and command and control platforms that are linked digitally in information-age armies organized as part of a joint network, one that includes the platforms and systems of sea, air and space forces. Future war is joint war; the whole of such a force is greater than the sum of its parts.

Direct fire will be redefined in the information age — armies will be able to shoot or move directly against enemies and targets even though they may be thousands to tens of thousands of kilometers away.³⁴ Finally, all these capabilities will be exercised under the watchful eye of independent, global, instantaneously-transmitting media.

An information-age army must be able to use these capabilities to defeat a variety of enemies — agrarian, industrial or informational. Therefore, we must be prepared to destroy or control armies — whether conventional armies of nation-states or those of feudal lords, religious groups, drug cartels, ethnic groups, crime syndicates, transnational corporations, or other entities that may emerge in the information age of the 21st century — as well as infrastructure, production base and information grid — again, whether in agrarian, industrial or informational societies. The military sector will reflect the variety of the information-age social, economic, political and private sectors.

Information-age armies will differ from those of the industrial age. First, they must be more flexible and versatile. They will also tend to be smaller, yet more capable — but only if they are equipped with modern technology, are well-trained and led, use up-to-date doctrine, and have organizations that fit their technology and doctrine. History suggests, however, that no peacetime army has ever gotten all this exactly right. As others have pointed out, in times of peace all armies will be wrong; successful armies are those who are not too badly wrong. And in time of war, successful armies are those who can adjust quickly.³⁶ Therefore, strategic common sense dictates that optimizing a force in peacetime entails significant risk; some redundancy and insurance must remain.

Second, information-age armies will differ from those of the industrial age in the processes used to create and sustain information-age capabilities. For example, force structures that can exploit and maximize speed and precision will replace industrial-age force designs. Information-age forces will not be attrition-based — force allocation rules, as well as personnel and equipment replacement or loss factors, will change. And an acquisition process able to keep a pace closer to the rate of technological innovation and production will replace the current industrial-age process. Decisionmaking processes will also change. They will include a mix of artificial and human intelligence and become much less a sequential process and more a simultaneous one.

This very short list of examples contains only a sampling of how fundamentally different information-age armies will be as compared to their industrial predecessors. The industrial model of mass mobilization, production, employment and logistics is passing. This model is being replaced by one of versatility, speed and precision. This new model will affect all levels of war — the strategic, operational and tactical — in ways we are only beginning to understand.

The new information-age model will affect the use of military force. The variety of conditions under which America, for example, will employ its information-age Army, especially in light of near-instantaneous global media coverage, will require very close strategic, operational and tactical-level coordination. Presently, this requirement is understood when the nation conducts what all clearly recognize as war. However, this requirement is less clear in those cases involving operations other than war. The information age will not allow us the luxury of this artificial distinction. Any use of America's information-age Army in a situation in which one or more of the parties are using violence to compel others to do their will requires that we approach the situation as war and require very strong civil-military and interagency links.

While on one hand much will change in the conduct of war in the information age, the nature of war will change little. Information-age war will not be remote, or bloodless, or sterile, or risk-free. Information-age war in all its variety will remain war. Death and destruction will remain the coins of war's realm. And the values of these coins will not diminish, regardless of how much technology is available to an information-age army. Nor will information-age war be absent uncertainty or ambiguity, for enemies will remain thinking, deceptive, cunning forces about whom we will never be able to have complete knowledge.

Even in the information age, the human heart and will govern action in war. Some person, as a member of a group, must still rush forward, drive forward, sail forward, or fly forward in the face of possible death or maiming. Thus, courage, selflessness, comradeship and leadership are not diminished by changing technology, organizations or concepts. And as long as human beings live as well as produce, distribute, finance, sell, and use their goods on land, soldiers and armies will remain the ultimate guarantee that a nation's vital interests and its security interests can be protected or advanced.

Finally, the root causes of war will remain constant. People still start wars — whether political leaders of nation-states or leaders of some other kind of organization. And they will start them as a result of fear, hatred, greed, ambition, revenge and a host of other quite human emotions and rationales. People will fight when they perceive that they can accomplish their objectives by resorting to force, or that they have no other alternative, or that honor or pride or principle or the gods demand it. People, therefore, will be needed to end wars. There is no “purely” technological solution to war because war, in the final analysis, can never be divorced from its human dimension. Though the conduct of information-age war will change substantially, the nature of war in the information age remains relatively constant.

The information age is not yet fully upon us. Some of the ideas described above are still nascent; others, however, are clearly visible and developing quickly. Industrialism's governing concepts have been fading for the past 20 years. It may take a decade or two more for industrialism to pass, but the pace of technical innovation in the information age is very fast. So is the growing understanding of the kinds of organizations and processes that will succeed in the ambiguous, diverse, and ever-accelerating conditions of the information age.

The 21st Century U.S. Army

The U.S. Army is neither idealizing the information age nor ignoring the obstacles that lie ahead to transform the Army. We are well along an ambitious journey, but resources are limited. Therefore, we are balancing dollars among funding current operations; resourcing the recruiting and retention of quality people; and paying for training, leader development and base operations, as well as for those programs involved in moving America's Army into the information age.

The Army understands the challenge. But at the same time the Army has requirements to be trained and ready for operations and to continue to provide a quality life for soldiers and civilians. We are forecasting as accurately as possible the military requirements of the information age, then making anticipatory policy and programmatic decisions so as to position the Army to meet these requirements.

A menu of forces and capabilities is being developed that will provide today's and tomorrow's National Command Authority and commanders in chief (CINCs) what they need. We are digitizing the battlefield right now. We are in a process of upgrading intelligence, maneuver, fire support, sustainment, and command and control platforms with advanced technologies that can gather, sort and distribute information among themselves. These technological insertions and upgrades will allow task forces to observe, decide, and act faster and more precisely than before. We will be able to mass effects — of fire support or maneuver forces — from dispersed locations, nearly simultaneously. The information-age requirements of speed and precision are being built into the Army today. This is the lethal, digitized force that gives meaning to the newly added operational tenet of versatility.

Units have been identified to experiment with information-age technologies, organizations and processes. Depth is being built into the force by building a seamless Army, leveraging the unique capabilities of active, Guard and Reserve forces, as well as the civilian work force. We are creating versatile leaders and organizations, able to succeed in ambiguous, hyperdiverse conditions — under the eye of the media and within the established rules of engagement. Major subordinate commands are being reengineered. And the Army is remaining steadfast in the belief that all of this rests upon acquiring and retaining quality people and providing them and their families a quality life.

The Army will continue to adapt its doctrine to the developing information age. The next edition of Field Manual 100-5, *Operations*, will capture the variety of the information age, describe the seductively flawed distinction between war and operations other than war, and flesh out the principles governing the conduct of warfare in the information age. FM 101-5, *Staff Organizations and Operations*, will adjust the decision-making processes and describe staff functions, duties and relationships for a digitized force. Other doctrinal manuals will follow suit.

The organization of battalions, brigades, divisions and corps will evolve over time to a size and composition that will provide the versatility needed to succeed on the variety of information-age battlefields. That evolution — as inevitable now as, in retrospect, we understand it was in response to the changes of the industrial age — will result also from finding the mix of soldiers, leaders, skills, functions and equipment that will optimize information-age technologies. The organization of the institutional Army will also change. Throughout the industrial period, and culminating during the Cold War, we created, then refined a set of policies, programs, procedures and models upon which were based personnel, mobilization, training, education, equipment, sustainment, deployment, employment, and command and control processes. We then built a set of organizations around these processes and created industrial-style bureaucracies to run them. Appropriate for their time, these processes — as well as the organizations and bureaucracies built to run them — are quickly becoming outmoded by the accelerating pace and variety of the information age. They are changing now and will continue to change.

Four basic forms of information will be the core upon which the information-age Army processes and organizations will be built: 1) content information — simple inventory information about the quantity, location, and types of items; 2) form information — descriptions of the shape and composition of objects; 3) behavior information — three-dimensional simulations that will predict behavior of at least physical objects, ultimately being able to “wargame” courses of action; and 4) action information — information that instantly converts to action.³⁷ Leveraging these forms of

information will allow Army organizations to maintain quality and increase “productivity” and effectiveness, even while reducing in size — similar to civilian corporations of the information age.

New training strategies are also emerging. Hands-on, performance-oriented training will remain valid, useful and essential. So will range firing and field exercises. Practicing under stressful, realistic field conditions will never go out of style, nor should it. But more and more, a variety of simulations and other computer-assisted programs will precede or follow hands-on and field practice. The limited training options of the industrial age — live or rudimentary, constructed simulation — are already passing. The information age will give commanders a much more robust and sophisticated set of options: live operations and constructed simulations, as well as interactive, virtual simulated exercises. These kinds of simulations do not replace live operations, but they will allow us to do more.

Simulations, often distributed and sometimes virtual, will form an essential part of the information-age training strategy. Simulations will intensify individual, leader and collective training. Soldiers, leaders and organizations can be immersed, repetitively and to increasing degrees of difficulty, in a variety of simulated scenarios and virtual reality situations.³⁸ This immersion will provide preparatory, remedial and reinforcement training — all excellent augmentations to the kind of hands-on field training essential to producing a trained and ready army. When incorporated with distributive technologies, a training strategy of this kind will enhance not only the readiness and proficiency of the active force, but also that of the National Guard and Reserve forces. These kinds of training strategies are being tested in the Army today.

The materiel of the early stages of the information age may look much like what we have now. But the tanks, infantry fighting vehicles, artillery pieces, rocket launchers, helicopters, command and control, engineer and logistical support vehicles, and trucks will be smarter. This will be done through computers and other advanced technologies, and from internetting. Further, they will be linked to similar systems of other services. The joint, digitally-integrated force that results will need supply, maintenance, and service systems different from those that supported the mass army of the industrial age. We will have to alter the rules by which combat, combat support and combat service support are associated in current Total Army Analysis models. The support planning factors in logistics manuals and wargames will also have to be altered. Otherwise, we will produce a gap between operational potential and sustainment capability. As the information age progresses, and inventions not yet conceived become reality — as was the case during the industrial period — the Army must be ready for whatever will follow the current set of maneuver, fire support, logistics, and command vehicles.

Last, leader development programs will evolve to accommodate the new conceptual, technical and organizational skills required of information-age officers and noncommissioned officers. Using more information that comes faster; making decisions at a faster rate; executing over increasing distances, in decreasing time, and under more diverse conditions; orchestrating the maneuver and fire systems of all services; and creating and maintaining cohesion among more dispersed units — all under the watchful eye of near-instantaneous media coverage — leaders of an information-age Army will think differently from those of the industrial age. At first, this difference will be only one of degree. As the information age matures, however, the difference will be one of kind.

The Army's institutional response to the demands of the information age is Force XXI, a structured effort to redesign the Army — units, processes and organizations — from the industrial age to the information age. Force XXI, a process that applies to warfighting, to Title 10 responsibilities, and to all components, will enable the Army to protect and defend the nation and provide decisive victory in the information age.

Change of the magnitude the Army is attempting is not easy. Nor is it uniformly embraced. Yet Americans are fortunate to have as one of their cultural characteristics a pragmatic attitude: "If it is better and makes sense, let's get on with it." We must continue to capitalize on this attitude in America's Army.

Ours is a time of rapid change. As such it is not only a time of uncertainty, it is also a time of opportunity. Success in the information age will go to those who have the courage to challenge themselves, who constantly innovate, and who learn and adapt as they go. Positioning the Army today so that it will succeed in the information age is a historic task, one that has already been taken on. The use of digits, information and the network of systems that will connect America's Army of the 21st century will help make the Army better able to serve the nation, just as the use of assembly lines and industrial processes has in the past.

The conduct of war is changing, but war will not become "remote" or "bloodless." We also know that the nature of war is not changing. No one of us has a clear picture of the future. No one conception of what the information age will bring is entirely complete and correct. But the foregoing description, drawn from a number of diverse sources, is an accurate enough forecast for the purposes of action.

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ENDNOTES

1. That different cultures have distinct ways to make war, even distinct concepts of what war is, is a major theme in John Keegan's new book, *A History of Warfare* (New York: Alfred A. Knopf, 1993); see pp. 386-392 for a summary.
2. James J. Schneider, "Vulcan's Anvil: The American Civil War and the Emergence of Operational Art," unpublished paper, School of Advanced Military Studies, Fort Leavenworth, Kans., June 16, 1991, p. 1.
3. Martin van Creveld, *Command in War* (Cambridge, Mass.: Harvard University Press, 1985), pp. 103-188; Martin van Creveld, *Technology and War* (New York: The Free Press, 1989), pp. 137-149; T.N. Dupuy, *A Genius for War* (Fairfax, Va.: Hero Books, 1984), pp. 44-69.
4. Schneider, "Vulcan's Anvil," pp. 9-10.

5. J.F.C. Fuller, *The Conduct of War: 1789-1961* (New York: Da Capo Press, 1961), pp. 86-94; van Creveld, *Technology and War* (New York: The Free Press, 1989), pp. 111-123 and 153-166; and Schneider, "Vulcan's Anvil," pp. 2-9.
6. This essay will limit its discussion to armies. This limitation should not be taken to mean that the overall argument of the paper does not apply equally to navies and air forces — it does. Applying the argument to navies and air forces, however, lies beyond the scope of this paper.
7. Forrest C. Pogue, *George C. Marshall: Ordeal and Hope, 1939-1942* (New York: Viking Press, 1965), pp. 139-165; quoted, p. 157. See also Russell F. Weigley, *Eisenhower's Lieutenants* (Bloomington, Ind.: Indiana University Press, 1981), pp. 2-7.
8. William H. Davidow and Michael S. Malone, *The Virtual Corporation* (New York: HarperBusiness, 1992), pp. 28, 162- 167, and 244-245.
9. Davidow and Malone, *The Virtual Corporation*, pp. 166-167.
10. Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century* (Boston: Little, Brown and Co., 1993), p. 19.
11. For one interpretation of the unsettling nature of periods of transition, see John Lukacs, *The End of the Twentieth Century and the End of the Modern Age* (New York: Ticknor and Fields, 1993), p. 282.
12. John Naisbitt and Patricia Aburdene, *Megatrends: Ten New Directions for the 1990s* (New York: Morrow, 1990), p. 9.
13. For other ways of looking at the principles and "governing concept" of the information age corporation, see "Seven Key Drivers of the New Business Environment" in Don Tapscott and Art Caston's *Paradigm Shift: The New Promise of Information Technology* (New York: McGraw-Hill, 1993), pp. 6-10; "The Corporate Identity Crisis" in Alvin Toffler's *The Third Wave* (New York: Morrow, 1980), pp. 226-243; "A New Kind of Business" in Davidow and Malone's *The Virtual Corporation*, pp. 1-19; or "Labor, Capital, and Their Future" and "The Productivity of the New Work Force" in Peter Drucker's *Post-Capitalist Society* (New York: HarperBusiness, 1993), pp.68-96.
14. Margaret J. Wheatley, *Leadership and the New Science* (San Francisco: Berrett-Koehler Publishers, 1992), pp. 8-9; see also pp. 25-45.
15. John Naisbitt, *Megatrends*, pp. 211-229.
16. Davidow and Malone, *The Virtual Corporation*, p. 6 (see also pp. 139-161 and 217-238); Michael Hammer and James Champy, *Reengineering the Corporation: A Manifesto for Business Revolution* (New York: HarperBusiness, 1993), pp. 50-101; Alvin Toffler, *Powershift: Knowledge Wealth and Violence at the Edge of the 21st Century* (New York: Bantam, 1991), pp. 180-189.

17. Peter Drucker, *Post-Capitalist Society*, pp. 68-74, especially pp. 83-109, and *The New Realities: In Government and Politics, In Economic and Business, In Society and World View*, (New York: Harper and Row, 1989), pp. 207-231; Davidow and Malone, *The Virtual Corporation*, pp. 167-174 and 184-216; Toffler, *Powershift*, pp. 204-232; and Tapscott and Caston, *Paradigm Shift*, pp. 10-13.
18. Wheatley, *Leadership and the New Science*, pp. 75-99; Toffler, *Powershift*, pp. 190-203.
19. Tapscott and Caston, *Paradigm Shift*, pp. 4-5.
20. Davidow and Malone, *The Virtual Corporation*, p. 89.
21. Hammer and Champy, *Reengineering the Corporation*, p. 51.
22. Toffler, *The Third Wave*, pp. 155-207 and 349-361.
23. Davidow and Malone, *The Virtual Corporation*, pp. 4, 3-7, 24, 42, 49, 107, 137, 141, 157-158, 162, 219 and 222.
24. Toffler, *The Third Wave*, p. 184; Davidow and Malone, *The Virtual Corporation*, pp. 219-221, 223-229, and 235-238.
25. Naisbitt, *Megatrends*, pp. 19-25. The author describes the three stages of technology: first, application of technology in ways least threatening to existing organizational norms; second, using technology to improve what we already have; last, new directions. He then goes on to argue that we are now in this last stage of technological innovation — the most threatening, yet most productive and innovative stage.
26. Hedrick Smith, *The Power Game* (New York: Random House, 1988), especially pp. 20-57, 119-159, and 333-450.
27. David Osborne and Ted Gaebler, *Reinventing Government* (New York: Addison-Wesley Publishing Company, Inc., 1992), especially pp. xv-24 and 311-331.
28. Paul Volcker and Toyoo Gyohten, *Changing Fortunes* (New York: Times Books, 1992), especially pp. 3-17, 59-100, and 287-310.
29. Jon Katz, "The Tales They Tell in Cyber-space Are A Whole Other Story," *New York Times*, January 23, 1994, section 2, pp. 1 and 30.
30. Toffler and Toffler, *War and Anti-War*, pp. 18-25; Davidow and Malone, *The Virtual Corporation*, p. 12.
31. This number excludes those soldiers permanently stationed overseas.

32. Toffler and Toffler, *War and Anti-War*, pp. 9-12 and 44-56.
33. General Gordon R. Sullivan and Lieutenant Colonel James M. Dubik, *Land Warfare in the 21st Century* (Carlisle Barracks, Pa.: Strategic Studies Institute, 1993).
34. Martin van Creveld, *The Transformation of War* (New York: The Free Press, 1991), pp. 192-227; Toffler and Toffler, *War and Anti-War*, pp. 81-85.
35. For a more complete description of the technological changes and trends already at work in land combat, see Sullivan and Dubik, *Land Warfare in the 21st Century*, especially pp. 12-25.
36. Michael Howard, "Military Science in an Age of Peace," *Journal of the Royal United Services Institute for Defence Studies*, March 1974.
37. Davidow and Malone, *The Virtual Corporation*, pp. 67-72.
38. Lieutenant General Fredric J. Brown (USA Ret.), *The U.S. Army in Transition II* (New York: Brassey's, Inc., 1993), pp. 99-106, 116-124, and 137-144.

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